
UNIT 9 AGRICULTURAL DIFFUSION AND REGIONAL SPECIFICITIES-I

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9.0 INTRODUCTION

The diffusion of agriculture in North India was marked by elements of continuity and change. The antiquities of irrigation, list of basic crops including rice and use of primitive plough can be dated to Harappan and post-Harappan period. However, the changes occurred in the nature of agricultural practices. These changes were to a large extent influenced by several of variables including ecology. While high yield variety of wet-rice cultivation was the hallmark of Gangetic plains the emerging variations in agriculture mechanism ushered in a new phase of irrigation outside this region. The transition from a plough-ard and wooden ploughshare to an iron one signalled the beginning of complex state societies. Extension of cultivation continued in the medieval period too. Some areas were colonised as late as 19th century AD. However, the real changes came in the form of introduction of several new vegetables and fruits by various agencies in the 16th and 17th centuries AD.

This unit discusses the nature of agrarian expansion in the aftermath of Harappan civilisation through the pre-colonial period in North India. The technological advancement and the adaptation to existing and borrowed knowledge marked the shift to the Gangetic plains and further diffusion of agriculture in to different

ecologies in the post-Harappa period. Environment, no doubt, played its part in this process but the role of the state and communities also began to assume gradual importance. We have focused in this unit on the:

- 1 possibilities of agriculture outside Harappa; crop-pattern and linkages, if any, with the Harappan civilisation;
- 1 agro-pastoralism and shifting subsistence patterns;
- 1 iron and wet-rice cultivation; their role in second urbanisation and early state formation;
- 1 shift of the agricultural epicentre to different ecologies and significance of irrigation;
- 1 phased formation of agricultural regions in early India; and
- 1 extension of cultivation areas and new crops, state interests and intervention in medieval period.

You will appreciate that the temporal and spatial expanse of the subject covered in this Unit is quite vast. We have, in fact, made an attempt here to encapsulate major developments in agriculture-environment interface. In this process it is likely that a few developments of significance may not have been selected by us in order of precedence.

9.1 GEOGRAPHY AND SUBSISTENCE STRATEGIES

The possibilities of agriculture, its spread and regional variations in early India were dependent on geography to a considerable extent. The status of cultivation in early India ranged from shifting cultivation to slash and burn to swidden (or *jhoom*) to hoe to plough cultivation. The passes and valleys facilitated the transhumance of pastoralists to and from Afghanistan or central Asia in the North and Tibet in the East. While some of the rivers, spreading a cover of the fertile silt attracted agriculturists, the fluvial uncertainties of some like Sutlej, Kosi, Tista and Brahmaputra brought disaster. The process of urbanisation supported by a flourishing hinterland was also uneven. While the first urbanisation in the Indus system is dated to the second half of third millennium BC and the second urbanisation in the Ganges system to the first millennium BC, the plains of Brahmaputra witnessed such developments at a later stage. Pre-conditions of agricultural development like land clearance was constrained by ecology and technology. The Gangetic plains were heavily forested and it was not before the effective use of iron began that the fertility of the soil could be tapped for agriculture on a wide scale.

Not all the regions within Northern plains were as fertile as the Gangetic area. Therefore complex societies could be sustained in the middle Gangetic plains and Eastern India. Here wet-rice cultivation yielded higher surplus. The rain-fed agriculture in the northwest was utilised to produce wheat and barley. The drier areas normally practiced cattle breeding. Western Rajasthan, the region of Thar Desert, hardly permitted conditions of cultivation. Caravan traders frequented the desert and subsequently the trading centres grew in the region. However, with the development of irrigation facilities some of the sub-regions in Rajasthan began to be cultivated. In contrast, the areas in the Northeast, Bengal and Orissa benefited from the blowing of the Northeast monsoon from December to February. These

areas received plenty of rain and were hence blessed with dense vegetation. Though it is difficult to map climatic changes and its consequences for agriculture but such changes have been indicated for the middle of the first millennium AD. Analyses of plant remains and soil belonging to the post-Harappan period in the Northwest point to growing aridity.

The variations in the settlement patterns and forests were often guided by climatic conditions. In the drier areas villages were generally nucleated. Fields bounded the settlements and pastures were located far away. In the wetter, rice-growing eastern India linear homesteads were the norm. As far as forests are concerned, the range included extensive rain forests of the wetter areas to tropical deciduous to pine and fir. Vegetation in these forests ranged from Savanna, bushes and coarse grasses to teak, ebony and sandalwood. The river systems of the Indus, the Ganges and the Mahanadi had estuaries where mangrove swamps could be found. (See, for more details, Unit 2, Block 1 on **Indian Landscape**).

Soil types have been the other important factor, which has decided the agricultural viability of different regions. From the fertile alluvial and cotton soil to not so fertile red soil and laterite, the differentiated availability of natural nutrients, water retention and pliability have all determined the nature and rate of agricultural growth. Riverine regions, which silt the flood plain, are preferred even when the location is hazardous. In relatively elevated areas deep ploughing is required. The use of ploughshare, iron in the north and wood in the peninsular region and its consequences for the agriculture have been debated among historians rather animatedly.

Uncertainties and vagaries of climate made cultivators dependant on agricultural calendars prepared by the local brahmanas. The agricultural operations of sowing and harvesting came to be associated with lunar and solar calculations. These calculations were based on the study of the phases of the moon, equinoxes and solstices.

9.1.1 Vana/Aranya and Ksetra/Janapada Dichotomy: The Theoretical Divide

Early Indian literature describes *Pulindas*, *Nishadas* and *Sabaras* as demonic figures relegated to the unknown, unpredictable wilderness. As described in the *Mahabharata*, the process of burning of *Khandava vana* for the settlement of Indraprastha destroyed many such demonic creatures along with animals and human beings. These forests and their inhabitants were juxtaposed to the predictable world of plough agriculturists. However, the vana/aranya and ksetra/janapada were neither homogenous nor immutable spaces. The perceived opposition between these two systems was maintained only in the theory as there could be overlaps in practice. *Harshacharita*, written in 7th century AD, refers to the acculturation of such forest dwellers says that and their subsistence activities were similar to those of their neighbouring peasants. Even the tribal settlements could transform into peasant villages. So the forest dwellers were not essentially hunter-gatherers. They practiced shifting cultivation or horticulture or even sedentary cultivation.

The images of forests, which were seen as home to demonic creatures earlier, came to be romanticised later. These were preferred by ascetics and seemed an ideal location for establishment of hermitages. Clearance of the forests to extend cultivable land did not cause enough damage to vegetation till the population was small but in the past few centuries it has continued unabated resulting in the

depletion of forest cover. *Arthashastra* of Kautilya recommended strict state control over forest clearance, perhaps to check over-exploitation.

9.2 THE AFTERMATH OF HARAPPAN CIVILISATION

Some historians regard the Harappan decline as transformation in the nature of civilisation. It is argued that while the urban features disappeared, agriculture in some areas continued and flourished. To understand this transformation we shall undertake a brief survey of some archaeological cultures.

9.2.1 Post-urban Harappan Situation

The post-urban Indus region was marked by several cultures. In the North West Frontier Province (NWFP) is found Swat Culture IV dated to C.1800-1400 BC. Here, the cultivators grew wheat (bread and shot), barley, rice, oat, lentil (*masur*), linseed and grapes. Cattle, goats, sheep and pigs were domesticated as well as consumed. In the Kachhi plains of Northeastern Baluchistan, sites like Sibri and Pirak testify the cultivation of *rabi* and *kharif* crops. *Rabi* crops include wheat (bread and shot), barley (six-rowed varieties), oats, chickpea and linseed while rice, millets (*jowar* and *cheena*) were the principal *kharif* crops found along with grapes. Goat, sheep and humped bull were being domesticated. The Jhukar Culture, spread over Jhukar (north of Mohenjodaro), Chanhudaro, Amri and Mohenjodaro itself consisted of very few settlements and does not provide us with evidences pertaining to cultivation of crops. In the Cemetery-H Culture discovered at Harappa, rice and finger millet (*ragi*) were introduced in this period. At a site named Hullas, *rabi* crops including wheat (shot and bread), barley, gram, lentils, oats, grass pea and field pea and *kharif* crops like rice, *jowar*, *ragi*, cow-pea, green-gram, horse-gram and cotton have been found. The increased number of settlements in Punjab (on the Indian side), Haryana and Northwestern Uttar Pradesh might have resulted from migration of some communities from Hakra and Ghaggar to upper reaches of Sutlej – Yamuna divide and to the upper Doab. Here, the extensive flood lands and heavier rainfall suited rice cultivation. Rice cultivation in period II-A along with millet, bajra or bulrush millet (*Pennisetum typhoideum*) in period III is obtained at Rangpur. A dry forest and a different climate existed in the region. This is indicated by identification of the trees of acacias, tamarisk and albizzia. At Rojdi, a site belonging to Gujarat, *kharif* crops including millets (*ragi*, *bajra*, *jowar*) and *rabi* represented by the lentil and pea have been discovered. However, rice is not reported.

9.2.2 Agro-pastoralism in Chalcolithic Cultures

Outside the Indus (Harappan) region a large number of hunter-gatherers, pastoralists and farmers existed. It is difficult to ascertain the Harappan influence on their lives. Some changes in the pattern of crop combination and the agricultural practices in the Neolithic-Chalcolithic period are discernible. Rice has been reported from the valley of Swat. Here, the discovery of a small ploughed field with furrow marks dated to 1300/1200 calibrated BC has led archaeologists to infer that a plough-ard was used. The earth was automatically pushed to one side of the furrow. Some sites dated to 3rd and 2nd millennium BC at Burzahom and Gufkral (Kashmir) were using sickle shaped implements for harvesting grain. Such implements are also discovered from Central Asia. Rice also occurs at Ahar in

Rajasthan, upper Gangetic valley, Chirand in Bihar, Orissa and the further East, possibly in Northeast and at a later date at Malwa. Wheat and Barley have been reported from Balathal in Southeast Rajasthan and appear as dominant crops in Malwa. Millets, generally cultivated in the South are represented in Balathal too. It has been suggested that the social pattern of the wheat growing area was not as complex as of those cultivating rice.

In central India and Rajasthan several chalcolithic sites have been investigated. Of these, mention may be made of Kayatha culture in the Chambal Valley, Dangwada in Ujjain and Ahar in Rajasthan. The site of Kayatha (Sample TF 402) brings out the evidence of cultivation of Indian jujube, two kinds of wheat (*Triticum sphaerococcum* and *Triticum compactum*) and seeds of horse gram. Faunal remains of bovine species and tortoise are also reported. Though five-fold cultural sequences spanning from Chalcolithic to early medieval times are discovered at Dangwada, the site context of material remains of the early period have not been satisfactorily understood. However, lentil, rice, horse gram and Indian jujube dated to Sunga and Gupta period are found. Ahar or Banas culture is located east to the Udaipur town in Rajasthan. The study of the chalcolithic layers points out to a possibility of a mixed economy. Here, agriculture and animal herding co-existed with hunting and fishing. Several impressions on the pottery sherds indicate to the cultivation of rice and millet. Vishnu-Mittre suggested that the factual history of millet was attested for the first time in the Ahar material culture. Sorghum, possibly *bajra* or bulrush millet was also cultivated. The sites abound in faunal remains pertaining to turtles, fish, goat, sheep, deer, pig and cattle.

In the Gangetic plains, the peasant, unlike the Indus culture, was no longer confined to the narrow strips of flood lands enriched by fresh doses of moisture and silt. The generosity of monsoons allowed him to increase the yield by shifting to new reclaimed virgin lands from forests. Several chalcolithic cultures like OCP (Ochre Coloured Pottery), BRW (Black & Red Ware), PGW (Painted Grey Ware) help us to understand the relationship between environment and crop pattern. The sites of OCP culture were generally located on the riverbanks. Such sites are spread over eastern Punjab, western UP and eastern Rajasthan. Atranjikhhera, one of the important excavated sites, remained flooded or water logged for a considerable period of time. The list of crops at Atranjikhhera includes two cereals— rice (*oryza sativa* L, *lathyrus sativus* L) and barley (*hordeum vulgare* L), and two pulses – gram (hulled and six-row gram) and *khesri*. Rice was cultivated as a summer crop and required plenty of water. Barley, a winter crop could produce good yield with modest irrigation. K A Chowdhury has suggested that the cultivation of gram was possibly the oldest record of its cultivation in India. *Khesri* was grown as a weed on dried up paddy fields. Both these pulses shared certain similarities; required small amount of water, cultivated as winter crops and belonged to legume family. These factors enhanced the fertility of the soil.

BRW culture is found in the upper Ganga-Yamuna and middle Gangetic Doab. Some of the important sites include Atranjikhhera, Noh, Jodhpura and Narhan. At Atranjikhhera, the crop pattern is basically similar to the OCP levels. At Noh rice impressions along with *urad* and kidney shaped seed of horse gram have been reported. The *oryza sativa* variety of rice is found from impressions at Jodhpura. At Narhan, one finds a well-developed agricultural regime. Hulled and six-row barley, rice (*oryza sativa*), club and bread wheat, mustard seeds, linseed and pulses (pea, *moong*, chickpea and *khesri*) are the main crops discovered here.

The sites of PGW culture are located in Western UP, Punjab, Haryana and Northern Rajasthan. These sites were on riverbanks and the inhabitants utilised both the cultivable plains and pastures. A sickle and hoe has been reported from Jakhera. The breeding of cow, buffalo, pig, goat, sheep and horse is indicated from the faunal remains. Wheat, barley and rice have been discovered at Atranjikhhera. The cultivation of wheat by PGW people (wheat requires water supply at regular intervals) has led K.A. Chowdhury to speculate on the possibility of irrigation in the period.

9.2.3 Subsistence in Transition: 'Pastoralism to Agriculture' in Vedic Corpus

Archaeological cultures provide enough evidence, as seen above, regarding agricultural practices and crop pattern. The Vedic corpus, however, map a transition from a pastoralist to an agriculturist society. The literary construct of 'eastward migration' of Indo-Aryan speakers from Punjab to western Ganges plain and further East is being increasingly challenged. However, it has provided insights into changing ecological frontiers, crop pattern and necessities of newer technologies. It is argued that the landscape of the plains was heavily forested and the climate was generally wetter. Some areas of the Punjab were semi-arid and hence more conducive to pastoral activities. The migration of the Vedic people to the Gangetic plain was through Himalayan foothills as it was difficult to cut paths across more dense forests in the plains. Communication was possible across rivers of the Ganges system.

Rigveda is replete with references indicating the presence of a predominantly pastoralist society. Several linguistic expressions denote the usefulness of cow in this period. In the absence of landed economy, cow was treated as a scarce resource and hence became an object of veneration. Also, the Rigvedic people engaged in cattle raids, fought over grazing grounds and control of river water. Herd owning clans could use common pastures. Another animal, horse rose to prominence in this period as cows could be herded from horse back to vast pastures. It also helped in cattle-plunder activities. Agriculture in the Sapta-Sindhu (land of the seven rivers) region was mainly used to produce fodder. The use of wooden ploughshare by the pre-existing societies is also not ruled out. In fact, the antiquity of plough is drawn to pre-Harappan times and Indo-Aryans borrowed words like *langala* from the non-Aryans. Agricultural products like *yava* or barley were offered in sacrificial rituals. The shift to the Ganga-Yamuna Doab or Kuru-Panchala area in the western UP was marked by the use of iron implements and 'six to twenty-four oxen' yoked to the plough. Though this seems to be an exaggeration, plough definitely became a symbol of power and fertility. The ploughing rituals are discussed in detail in *Shatpatha Brahmana*. Although the later Vedic texts speak of iron, agricultural implements have not been satisfactorily discovered. Rice and wheat began to be cultivated along with already cultivated barley. It is postulated that the dominant pastoral chiefs acted as administrator-protector of local agriculturists. Pastoralists and agriculturists shared a symbiotic relationship as the agriculturists made available post harvest stubble for the herds to feed on. The animal droppings could manure the fields. Also, pastoralists did not stick to one place for long and acted as periodic carriers of products of exchange.

The transition from chalcolithic to the NBPW (Northern Black Polished Ware)/early historic period in the upper Gangetic plains was marked by growth in

number of sites, enhanced settlement size and increase in geographical extent of inhabited area. Within the NBPW culture habitation spread from well-drained area away from lakes and rivers to the most inhospitable areas. Some of the areas like Mathura remained pastoral for centuries because the soil was not conducive for the growth of agriculture. In contrast, the middle Gangetic plains did not have settlement clusters or nucleated villages before 500 BC.

The NBPW (also known as deluxe pottery) culture marks the arrival of sedentary peasant farming. This is testified by evidence related to cultivation of varieties of rice (including the transplanted) and plough cultivation etc., resulting in high yield. The proliferation of settlements in this period is attributed to wet – rice cultivation and its increased yield.

9.3 SECOND URBANISATION AND COMPLEX STATE SOCIETIES

The process of urbanisation in early historic India presupposes the support of a prosperous hinterland. The environmental conditions like land, soil and moisture etc. not only conditioned the hinterland and their agricultural viability but also had a direct bearing on the specific crops being produced. Newer technologies and higher yield can be considered as the important bases of urbanisation. The forces unleashed by these socio-economic changes created favourable conditions for the arrival of complex state societies.

9.3.1 The Environmental Setting

The centres of second urbanisation, located in the different regions like Northwestern borderlands, central Ganges plains, Ganges-Brahmaputra delta, Western coastal plains, deltas of the Eastern coast and in central and peninsular India shared the common factors of soil fertility and higher agricultural potential. Tamra Nala and Lundi Nala watered Taxila. The Northeastern valley was home to Buddhist monasteries and is today famous for citrus orchards. Buddhist monasteries were also situated in Charsada through which flowed the Kabul and Swat rivers. Kandhar is known as the oasis city on the Eastern side of Dasht-i-Margo, the desert basin of Helmund River. The central Ganges plains are an area of monsoon climate and large forest trees can be found here. As one traverses eastwards, two features change: steady increase in rainfall and humidity and the replacement of the open grazing grassy lands by the paddy fields. Varieties of alluvium could be utilized at different times and in different climatic conditions. Settlements in the older alluvium were regularly established. This situation is also true of Ganges-Brahmaputra delta. Rice was grown as the principal crop. The agricultural potential and the environmental setting of central Gujarat plains are similar to those of Western Ganges plains. Interestingly, this region shows a spatial overlap from the first urbanisation to second urbanisation in the Indian sub-continent. On the basis of a study of settlement patterns of Kathiawad, it has been suggested that the region practiced flourishing cultivation in the early historic period.

9.3.2 Iron and Rice: The Causative Agents

The rise of second urbanisation and complex state societies in the first millennium has been linked to transformative potential of iron technology and wet-rice cultivation. It is suggested that these two elements facilitated the increase in carrying capacity

of the land and helped in sustaining urban centres. Urbanism seen in its various dimensions viz., proliferation of settlements, arts and crafts was inextricably linked to the new methods of cultivation and the higher yield. Some historians have questioned this technological determinism. It is argued that in the chalcolithic cultures outside Harappa, the cultivated land not only included the alluvial strip of river valleys but also the heavier, extensive stretches of black cotton soil. However, the amenability of the black cotton soil to heavy iron-tipped plough is recognised. The factor of rice, as we shall see, is also a vexed issue. As far as the crop pattern is concerned, the basic list remains the same from the BRW to NBPW phase. Also, the Doab region was already being exploited in the PGW phase. The inhabited settlement area rose by 32% from the BRW to PGW and 38% from the PGW to NBPW.

In order to appreciate the causal agency of iron in the historical change, it would be worthwhile to undertake a brief survey of various stages of use of iron in early India. Up to 700-600 BC, the sites of Kausambi, Hastinapur and Atranjikhhera show that the agricultural productivity remained low and the economy was marked by a combination of hunting, animal husbandry and agriculture. However, except for stray discoveries of cutting tools like sickle and axe no agricultural implements have been found. Land was either cultivated by wooden ploughshare or it may have been of marginal significance. It is remarked that the fields in the riverine regions develop cracks following a flood. The practice of filling seeds in these cracks with the help of brooms exists even today. The period between 700/600 BC- 1st Century AD is characterised as middle iron phase. Some of the sites in this period were located near raw-material rich areas. The agricultural situation undoubtedly improved from single to double crop arrangement as has already been cited in the case of Narhan excavation. Besides sickles and axes, ploughshare, spades and hoes have been reported. However, as represented at the site of Rajghat, animal husbandry, both the drought and milch animals was still in vogue. The emergence of historical period in the first millennium BC/AD definitely ushered in an era of agricultural implements.

It can be suggested that the farming implements were virtually absent in the early phase though the process of colonisation and exploitation of riverine regions had already begun. Also, the sites such as Pirak would show that mere presence of iron tools in the site sequences might not have evolved in to an iron age. Even if seen in the wider context of environment and patterns of land, the rise of urban centres and complex state societies in the 1st millennium should not be attributed to the single factor of iron.

Manifestations of wide varieties of rice cultivation in archaeology and literature and the significance it acquired in Indian rituals underline its antiquity. Archaeologists have argued in favour of an Indian centre of origin of cultivated rice. Chinese and South-East Asiatic centres may not have had a uniform, direct bearing of rice-cultivation in India. The evidence of rice-cultivation at Koldihawa, the calibrated ranges of which are 7505-7033 BC, 6190-5764 BC and 5432-5051 BC cannot be summarily dismissed. Although the 'seed broadcast' method was initially practiced, the transplanted variety began to be cultivated in the middle Gangetic valley only. It was a well-established practice by the beginning of the early historic period. The enhancement of yield under transplanted variety is an undeniable fact. Whether this variety along with other variables had a direct bearing on rise of complex state societies is still being debated.

9.4 EARLY INDIA: IRRIGATION, RECLAMATION AND PHASED FORMATIONS

The nature of presence of a pan-Indian polity or an empire in early India has aroused lot of interest among scholars. Attempts have been made to redefine the term 'empire' in this context. It is now widely held that Mauryan Empire consisted of many variegated peripheral regions and so there could not have been uniformity in subsistence strategies. The process of reclamation in early India necessitated the construction of viable irrigation mechanisms. Since the regions were uneven because of their environmental features and convergence of historical forces, the agricultural regions emerged in a phased manner.

9.4.1 Irrigation Patterns in Early India: The Construct of Hydraulic Despotism

The variations in the irrigation system in early India depended on particular environment, acreage of land under cultivation and the sponsoring agent- the state, communities or individual. In other words, natural conditions and the control mechanism determined the type of irrigation. It could range from simple channels diverted from river or natural streams, water-bailing machines, pot-fitted wheels attached to the wells to developed technologies like Persian wheels, hillside channels watering terraced fields, canals, large reservoirs, tanks and embankments. The availability of water resources does not follow a uniform pattern. Uneven rainfall, failure of the monsoons, and scarcity and excesses of water have always compelled people to restrain and regulate the natural sources. Kautilya's *Arthashastra* classifies the modes of water supply as: (1) *Hastaprayartima*- drawing water with hands and carrying it to the fields in the pitchers; (2) *Skanda*- carrying water on the shoulders or the neck of the bullocks; (3) *Srotyantra*- a mechanism for lifting water in channels flowing in to the fields; and (4) *Udghatam*- the water wheel for raising water from river, etc. There is no dearth of literary references pertaining to irrigation in the Mauryan period. Archaeological excavations attest the presence of several terracotta ring wells at Hastinapur, New Delhi, Ropar, Ujjain and Nasik. These have also been reported in Eastern UP and Bihar. Although not all of them were used for irrigation purposes, there is evidence that the water from brick well at Ujjain irrigated the fields. Many tanks (including the votive ones) have been discovered at Taxila, Hastinapur, Udaipur, Ahicchatra (in Bareilly), Kausambi and Bhita. A number of tanks found at Mathura were also being used for irrigation. What is noteworthy about these tanks and wells is that these were mostly located in areas where irrigation was necessary. In comparison, there was a relative paucity of wells, tanks and canals in the central Gangetic plains. There was general increase in the number of wells in the post-Mauryan period notwithstanding the decline in the number of ring wells. The significance attached to artificial irrigation underwent a change during state- formation. Here, the reasons more than cause of subsistence were economic and political. Greater attention was paid to agriculture for it was the primary source of revenue. In the Swat region a tank was developed in 29 AD under the instructions of Theodorus, the Dataputra. The region of Saurashtra bears testimony to the history of Sudarshan Lake. Later the dam of the lake was badly damaged because of heavy flooding. In the second century AD this lake was renovated under Saka ruler Rudraman. Similarly, king Kharvela extended an old canal in Kalinga. At Besnagar in Madhya

Pradesh is found an old canal. The Bes River was located about two furlongs from this canal. It has been suggested that this canal was perhaps an inundation canal because rivers in this part of the country overflow in the rainy season and remain dried up in the summer. As far as the role of state is concerned, some of the irrigation sources necessitated state's initiatives. The initial outlay of the canal required huge expenses and hence was beyond the means of individuals and communities. They could build relatively less expensive tanks but these tanks could not irrigate large areas.

It was only with the publication of Karl A. Wittfogel's work on "Oriental Despotism" that the studies on water resources and its relation with the state gained impetus. Wittfogel proposed that the requirement of large-scale irrigation in arid or semi-arid region led to an enormous hydraulic organisation, which in course of time became the source of agro-hydraulic despotism. Organisational forms developed inevitably because water's specific properties needed task management. Wittfogel's contention is that the hydraulic route was a deliberate choice for it provided productive benefits. In such a system the state became all powerful and acquired matchless military power with even the dominant religion fused within the structure. Wittfogel classified the Mauryan Empire as a grandiose hydraulic economy. No legal and social pluralism was allowed to exist in a hydraulic state and its absolutist nature remained undisturbed. To enhance the plausibility of his theory, Wittfogel applied to it all the central elements of 'totalitarianism'. He devised the theory of 'diffusion and generalisation' in order to explain variations from his ideal model. Variation, according to him occurred due to the coreness of the area and its relation to marginal and sub-marginal regions. Property rights, which were weak in a hydraulic state, also formed the basis of variation, viz. (a) simple, (b) semi-complex and (c) complex. Indian case was picked up as a semi-complex model. The relation with the state determined class position in such a society. The ruled did not participate in the state process.

Karl A. Wittfogel's hydraulic theory was basically an ecological and sociological explanation of 'Oriental Despotism'. Wittfogel's understanding of historical geography is seen as flawed. Only the northwestern part of Indian subcontinent was arid. Early agrarian societies developed in semi-arid regions because these could be irrigated by inundations, while humid areas covered with forests had to be cleared before these could be cultivated. In the other parts of Indian subcontinent, irrigation could be a communal, provincial and state responsibility. Kautilya's *Arthashastra* does not refer to any officer in charge of irrigation, when even the bureaucracy is shown as a large one. The repair of the embankment of the Sudarsana Lake by the governors under the Mauryans, Rudradaman and the Guptas indicates that irrigation was also a provincial responsibility. In the post-Mauryan period, the state generally ceased to bear the main responsibility for irrigation. The rulers undertook occasional levies from the peasants to accomplish the work. It has been suggested that hydro-agriculture was better suited to India. Kautilya preferred small-scale irrigation. Kautilya, while enumerating different types of irrigated lands perhaps makes mention of a channel from a tank or dam rather than a canal. Even the canals mentioned above were too small for large-scale irrigation. Wittfogel ignored the role of technology. He did not visualise the struggle of human beings against nature. It has been argued that both Kautilya's *Arthashastra* and Abu'l Fazl's *Ain-i-Akbari* focus on the extension of cultivation to wasteland rather than artificial irrigation.

9.4.2 Proliferation of Agrarian Knowledge: Formation of Sub-Regions and Regions

In the post-Mauryan period, the epicentre shifted from the Gangetic areas to the peripheries. New centres of power emerged. By the 3rd Century AD large parts of the Himalayan zone, Assam, West Bengal, Orissa, Eastern MP, Rajasthan and Gujarat did enter the historical phase. The bases of state formation in Gupta and post-Gupta period can be located in diffusion of iron technology, plough agriculture and the role played by the *Brahmana* migrants. State formation in the hills of Punjab took place only in this period. At least 48 kingdoms existed in the largely forested red soil areas of Maharashtra, Eastern MP, AP, Orissa and Bengal. It has been remarked that the spread into different areas was not without conflict. Agrarian expansion and reclamation pattern largely depended on the nature of land endowments in the early medieval period. The traditional wisdom of *Brahmanas* regarding rainy season, sowing season etc., and the knowledge of known practices of agriculture was diffused in different areas. The preservation of cattle wealth espoused by brahmanic ideals helped agrarian economy. Several texts dealing with agricultural knowledge began to be translated in the vernaculars. An important example of the diffusion can be seen in a 9th century inscription from the Ajmer area. The term *brhadhala* mentioned in the inscription means big plough, which could have helped in breaking difficult soil, and make it pliable. Pounders were used in Bengal under the Palas. As these developments indicate, sub-regional agrarian bases developed in the post-Gupta period. The process of agrarian expansion continued unabated and the 6th-9th centuries AD were marked by emergence of agricultural regions. Bengal under Palas and Senas, Orissa under Somavamsis and later Gangas are cases in point.

By the early medieval period different modes of water supply came to be associated with different regions. Western India was characterised by construction of wells (*vapis*) in Rajasthan and Gujarat. The use of *arahattas* became popular in 6th-9th century Rajasthan. *Harshacharita* refers to *Udghatagati* and *Ghatiyantras*, which were in vogue in western UP. Ponds, came to be associated with rural Bengal. The access to and utilisation of these water bodies necessitated the organisation of supra-village organisation and in course of time could create nodal points in the rural space.

However, not all the areas witnessed uniform pattern of reclamation. In Bengal deltaic regions were also colonised. In the regions like Rajasthan, Gujarat and Maharashtra land endowments were made in the waste areas. The transfer of privileges and certain rights to the beneficiaries of these endowments posited them in an advantageous position vis-à-vis the ranks of peasantry. However, in the Brahmaputra valley the land endowments were located in already reclaimed areas. In fact, core of the valley was reclaimed before the onset of early medieval period. Limited practice of wet –rice cultivation by the Kachari people is evident from the epigraphic terms and ethnographic literature on pre-modern irrigation in the valley. Reclamation in the hilly fringes of the valley continued till the 19th century AD.

9.5 SITUATION IN MEDIEVAL PERIOD

Extension of cultivation continued in the medieval period too. Sultanate rulers are credited with the extension of cultivation, reclamation and construction of canals. The trend continued under Mughals too. Integration of some regions in Assam

started only in the medieval period and continued even in the colonial period till 19th century AD.

9.5.1 Crop-patterns: Continuity and Change

In the medieval period, the Sultanate rulers may not have directly promoted agrarian expansion unlike early India. However, their interest in the land-revenue system is undeniable and it had an indirect bearing on agricultural production. The imperial dominion consisted of large areas of alluvium soil. There were though certain exceptions like Siwalik Hills due northwards or the broken Aravalli ranges in the South–West of Delhi. As demonstrated in *Baburnama*, the dry stretch of Agra–Gwalior necessitated the creation of artificial water storage facilities. The region of Mewat received inadequate rainfall and hence could not be cultivated without artificial means of irrigation. Exceptions, however small, had a definite bearing on crops harvested. While generally two crops, *kharif* (monsoon) and *rabi* (winter) were harvested, there was a possibility of a third *zayad* or additional crop of short duration in Doab.

As far as crop patterns are concerned, the situation in the medieval period continued to be the same from preceding times except for a few changes. Rice and sugarcane were produced in the East and wheat, oil seeds etc in the North. Sugarcane was probably introduced in the 17th century AD. Cotton was extensively cultivated along with inferior crops like *bajra* ('diet of the poor') barley and sesame. Some of the crops came to be cultivated on a much wider scale. Wide scale cultivation of poppy might not have taken place before 16th century AD. Maize (*makka*) began to be cultivated in Maharashtra and Rajasthan only in the second half of 17th century A.D. The cultivation of fruits also received attention of the medieval rulers. Pomegranates are specially referred to. Jodhpur specialized in its cultivation and even the Persian varieties were no match to these. Rulers like Muhammad Tughlaq and Firuz Tughlaq are credited for developing a large number of gardens in and around Delhi and Chittor. Grapes received special attention in these gardens. These orchards however produced mainly for the towns and the elites. Portuguese are credited with introducing tobacco and also some fruits in India. These include papaya, cashew nuts and pineapple. Coffee was also introduced in this period.

9.5.2 State Intervention and Regional Variations

The area under cultivation substantially increased under the Sultanate and the Mughal rulers. During the Sultanate period the route to Delhi was largely afforested and Mewat posed hazards to trading groups. Balban ordered the cutting of forests and subsequently constructed Gopalgiri fort, which was put under Afghans. In course of time the area began to be cultivated. Areas of Multan district, an arid waste region were colonized under Ainul-Mulk Mahru. Several canals and water channels were constructed here. Subsequently, the production of the area doubled. Firuz Tughlaq contributed substantially to construction of an extensive system of canals. The canals from Yamuna, Sutlej and Ghaggar watered the areas of Hissar in Haryana. In Sind and Punjab, the canals were relatively smaller but contributed to growth of agriculture. According to estimates worked out by historians, extension of cultivation almost doubled from 16th to the beginning of 20th century AD. The clearance of forests and agrarian expansion continued in Bihar, Bengal and Awadh. The practice of constructing canals continued under Mughals also but it is suggested that owing to their low level of flowing their potential for irrigation remained limited.

The agricultural situation in the medieval Northeast began to change from 13th century AD. onwards. Brahmaputra valley under the Kacharis was acquainted with plough and wet rice cultivation. However, cultivation was predominantly shifting in nature besides gathering (of fruits, roots and herbs) and hunting-fishing activities. The subsistence economy of the region was not able to defend itself from the invading agriculturists. Ahoms were basically an agricultural tribe and if the legend is believed they came to the valley in search of cultivable land. They subjugated the local tribes and established themselves in the extreme southeastern part of the valley. Ahoms originally belonged to Mongolia, China and are credited to have introduced wet-rice cultivation on a wider scale in the Brahmaputra valley.

Contemporary chroniclers noted sub-regional variations within Assam. Mughal chronicler Shihabuddin Talish remarked that even the foreigners were attracted by the flourishing wet-rice cultivation in Brahmaputra valley. On the other hand, Ralph Fitch in 1585 noted only the cultivation of silk, bamboo, cotton, cane etc., in the lower Assam. Compared to the valley, the hills practiced primitive methods of rice cultivation besides hunting and gathering activities. With little modifications the variations still exist.

9.6 SUMMARY

The study of agricultural diffusion in the North India shows that the basic list of crops did not change much with the eastward movement in the aftermath of Harappan civilisation. However, the Gangetic plains once made cultivable created favourable situation for further expansion. The shift of the epicentre from the Gangetic plains to peripheries was accompanied with the tapping of iron and other resources. Red soil forest terrain was colonised in a big way in the early medieval period. The practice of making land endowments to *brahmanas* facilitated the diffusion of agricultural knowledge. The role of the state is undeniable. What is debated is its degree of control. The rulers from the early medieval times not only granted land but also ordered the clearance of forests and construction of irrigation facilities. They also encouraged cultivation of new crops and development of orchards.

9.7 EXERCISES

- 1) Why did plough become a symbol of power in later Vedic period? Discuss.
- 2) Do you think the settlement patterns changed in the NBPW/early historic period? Comment.
- 3) How were the seeds sown in the riverine region? Describe.
- 4) Which of the following is true or false?
 - a) As discussed in *Baburnama* the Gurgaon-Jaipur stretch was a dry one.
 - b) Poppy cultivation on wide scale only began in medieval India.
 - c) Persian variety of pomegranate was better than the Jodhpur one.
 - d) *Zayad* is an additional crop of short duration.

- 5) What was the basic objective of land classification in medieval period?
- 6) Medieval India was marked by a relative surge in irrigation devices. Explain.

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